

Amendments to the Claims:

1. (currently amended) A method of communication using Orthogonal Frequency Division Multiplexing ('OFDM'), the method comprising the steps of:

generating bit streams  $b_n \in (0,1), n=0,1,\dots,K-1$  and the corresponding sets of

frequency domain carrier amplitudes ( $X_0(k)$  to  $X_M(k)$ ), where  $k$  is the OFDM symbol number, modulated as OFDM symbols to be transmitted from a transmitter,

inserting prefixes as guard intervals in said sample streams,

transmitting said OFDM symbols from said transmitter to a receiver,

using information from said prefixes to estimate the Channel Impulse Response ( $H_D^{(F)}$ ) of

the transmission channels at the receiver, and

using the estimated Channel Impulse Response ( $\hat{H}_D^{(F)}$ ) to demodulate said bit streams in

the signals received at said receiver, wherein said prefixes ( $\alpha_k.c_0$  to  $\alpha_k.c_{D-1}$ ) are

deterministic and are known to said receiver as well as to said transmitter, wherein ( $\alpha_k$ )

is a weighting factor proportional to  $e^{j\frac{2\pi}{N+D}m}$ , where  $N$  is the useful OFDM symbol size,  $D$

is the size of the prefix vector, and  $m$  is an integer, and further performing the

multiplication by a matrix proportional to

$$\underline{R^{(1)}(k) = \sqrt{N+D} \cdot [\hat{V}] \cdot r(k), \text{ where}}$$

$$\underline{[\hat{V}] = \left( \sum_{n=0}^{N+D-1} |\beta_k|^{\frac{2n}{N+D}} \right)^{-\frac{1}{2}} \bullet \text{diag} \left\{ 1, \beta_k^{\frac{1}{N+D}}, \dots, \beta_k^{\frac{N+D-1}{N+D}} \right\} \bullet \beta_k = \frac{\alpha_k}{\alpha_{k+1}} \bullet}$$

calculating the frequency shifted CIR coefficients

$$\underline{\hat{H}_{N+D}^{Shifted,F} = \left( \hat{H} \left( \beta_k^{\frac{1}{N+D}} \right) \dots, \hat{H} \left( \beta_k^{\frac{1}{N+D}} \bullet e^{j2\pi \frac{N+D-1}{N+D}} \right) \right) \bullet \beta_k = \frac{\alpha_k}{\alpha_{k+1}} \bullet}$$

performing a component-by-component division

$$\underline{R^{(2)}(k) = R^{(1)}(k) \otimes \hat{H}_{N+D}^{Shifted,F},}$$

performing a multiplication by a matrix proportional to

$$R^{(3)}(k) = [\hat{V}]^{-1} \cdot \frac{1}{\sqrt{N+D}} \cdot R^{(2)}(k).$$

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extracting the  $N$  equalized samples corresponding to the  $k^{th}$  data symbol to the vector

$S^{EQ}(k)$ , and

transforming the symbol  $\hat{s}(k)$  into frequency domain by performing a Fourier

Transform:  $S_F^{EQ}(k) = [F_{N \times N}] \cdot S^{EQ}(k)$ .

2. (original) A method of communication as claimed in claim 1, wherein said prefixes  $(\alpha_k.c_0$  to  $\alpha_k.c_{D-1})$  comprise a vector  $(P_D)$  that is common to said symbols multiplied by at least one weighting factor  $(\alpha_k)$ .

3. (original) A method of communication as claimed in claim 2, wherein said weighting factor  $(\alpha_k)$  differs from one symbol to another but the elements of a given vector  $(P_D)$  are multiplied by the same weighting factor.

4. (original) A method of communication as claimed in claim 3, wherein said weighting factor  $(\alpha_k)$  has a pseudo-random value.

5. (previously presented) A method of communication as claimed in claim 1, wherein said weighting factor  $(\alpha_k)$  is a complex value.

6. (original) A method of communication as claimed in claim 5, wherein the modulus of said weighting factor  $(\alpha_k)$  is constant from one symbol to another.

7. (canceled).

8. (previously presented) A method of communication as claimed in claim 1, wherein estimating said Channel Impulse Response  $(H \frac{(F)}{D})$  comprises performing a Fourier Transform on a first vector  $(V_{HP})$  that comprises the received signal components corresponding to one of said prefixes  $(\alpha_{k,c_0} \text{ to } \alpha_{k,c_{D-1}})$  and also the received signal components corresponding to the following one of said prefixes to produce a received prefix signal transform  $(V_{HP,F})$ , performing a similar Fourier transform on a second vector  $(V_P)$  that comprises the known values of corresponding components of said prefixes  $(\alpha_{k+1,c_0} \text{ to } \alpha_{k+1,c_{D-1}})$  and also the received signal components corresponding to the following one of said prefixes  $(\alpha_{k,c_0} \text{ to } \alpha_{k,c_{D-1}}, \alpha_{k+1,c_0} \text{ to } \alpha_{k+1,c_{D-1}})$  to produce a known prefix transform  $(V_{P,F})$ , and performing a component-by-component division of the receiving prefix signal transform  $(V_{HP,F})$  by known prefix transform  $(V_{P,F})$ .

9. (original) A method of communication s claimed in claim 8, wherein said prefixes comprise a vector  $(P_D)$  that is common to said symbols multiplied by weighting factors  $(\alpha_k, \alpha_{k+1})$ , said weighting factors differing from one symbol to another but the elements of a given vector being multiplied by the same weighting factor, and wherein the received signal components corresponding to said one of said prefixes  $(\alpha_k.c_0$  to  $\alpha_k.c_{D-1})$  and said following one of said prefixes  $(\alpha_{k+1}.c_0$  to  $\alpha_{k+1}.c_{D-1})$  are weighted by the respective value of said weighting factor  $(\alpha_k, \alpha_{k+1})$  before summing and performing said Fourier Transform to produce said received prefix signal transform  $(V_{HP,F})$ .

10. (previously presented) A method of communication as claimed in claim 8, wherein said Fourier Transforms are of dimension  $D \times D$ , where  $D$  is the size of said prefixes  $(c_0, \alpha_k$  to  $c_{D-1}, \alpha_k)$ .

11. (previously presented) A method of communication as claimed in claim 8, wherein said Fourier Transforms are of dimension  $(D+N) \times (D+N)$ , where  $D$  is the size of said prefixes  $(\alpha_k.c_0$  to  $\alpha_k.c_{D-1})$  and  $N$  is the size of the OFDM signals between said prefixes, said first vector  $(V_{HP})$  comprises said sum of said received signal components corresponding to one of said prefixes  $(\alpha_k.c_0$  to  $\alpha_k.c_{D-1})$  and of the following one of said prefixes  $(\alpha_{k+1}.c_0$  to  $\alpha_{k+1}.c_{D-1})$  augmented by a zero value vector  $(0_N^T)$  of size  $(N)$  to produce said received prefix signal transform  $(V_{HP,F})$  of size  $(N+D)$ , and said second vector  $(V_P)$  comprises said known components of said prefixes  $((\alpha_k.c_0$  to  $\alpha_k.c_{D-1}, \alpha_{k+1}.c_0$  to  $\alpha_{k+1}.c_{D-1})$  augmented by said zero value vector  $(0_N^T)$  of size  $(N)$  to produce said known prefix transform  $(V_{P,F})$  of size  $(N+D)$ .

12. (previously presented) A method of communication as claimed in claim 1, wherein estimating said Channel Impulse Response ( $H_D^{(F)}$ ) comprises combining information from said prefixes ( $\alpha_k.c_0$  to  $\alpha_k.c_{D-1}$ ,  $\alpha_{k+1}.c_0$  to  $\alpha_{k+1}.c_{D-1}$ ) for more than one symbol to obtain said estimated Channel Impulse Response ( $\hat{H}_D^{(F)}$ ).

13. (canceled).

14. (previously presented) A method of communication s claimed in claim 1, wherein demodulating said bit streams includes padding the received signal matrix and the operator matrices with zeros to obtain compatible dimensions for subsequent operations, multiplying the known prefix value matrix by the Channel Impulse Response estimation matrix and subtracting the result from the received signal matrix.

15. (previously presented) A transmitter for use in a method of communication as claimed in claim 1 and comprising generating means for generating bit streams

$b_n \in (0,1), n = 0, 1 \dots, K - 1$  modulated as OFDM symbols to be transmitted and inserting prefixes as guard intervals between said OFDM symbols, said prefixes ( $\alpha_k.c_0$  to  $\alpha_k.c_{D-1}$ ) being deterministic and suitable to be known to said receiver as well as to said transmitter.

16. (previously presented) A receiver for use in a method of communication as claimed in claim 1 and comprising demodulating means for receiving signals that comprise bit streams

$b_n \in (0,1), n = 0, 1 \dots, K - 1$  modulated as OFDM symbols to be transmitted from a transmitter, with prefixes inserted in guard intervals from said transmitter to said receiver, said demodulating means being arranged to use information from said prefixes to estimate the Channel Impulse Response ( $H_D^{(F)}$ ) of the transmission channels and to use the estimated Channel Impulse Response ( $\hat{H}_D^{(F)}$ ) to demodulate said bit streams in the signals received at said receiver, said prefixes ( $\alpha_k.c_0$  to  $\alpha_k.c_{D-1}$ ) being deterministic and being known to said

receiver as well as to said transmitter.